Remarks

Claims 1-7 are pending herein. By this Amendment, claims 1, 5 and 6 have been amended.

Specifically, claims 1, 5 and 6 have been amended to recite that a mixed gas of an HF gas and an NH_3 gas is supplied into the treatment vessel. Support for this recitation can be found in the specification at, e.g., page 10, lines 18-19.

In the Office Action, claims 1-3, 5 and 6 are rejected under 35 U.S.C. §102(b) as being anticipated by JP 2000-223430 ("JP '430"), and claim 4 is rejected under 35 U.S.C. §103(a) as being unpatentable over JP '430.

In view of the amendments and remarks herein, Applicants respectfully request reconsideration and withdrawal of the rejections set forth in the Office Action.

I. Rejection Under §102(b)

As noted above, claims 1-3, 5 and 6 are rejected under §102(b) as being anticipated by JP '430.

Applicants respectfully submit that JP '430 does not anticipate amended claims 1, 5 and 6 or dependent claims 2 and 3. JP '430 corresponds to U.S. Patent No. 6,383,300 to Saito et al. ("Saito '300") and U.S. Patent No. 6,807,971 to Saito et al. ("Saito '971"), collectively referred to herein as the "Saito patents".

Claims 1, 5 and 6 have been amended to recite that a mixed gas of an HF gas and an NH_3 gas is supplied into the treatment vessel. The instant specification teaches that:

> [a]ccording to the present invention, a mixed gas of an HF gas and an NH_3 gas operating as a cleaning gas can rapidly, efficiently remove unnecessary SiO_2 film (silicon oxide film) formed by TEOS and deposited on structural members in a heat treatment apparatus, while damage to the structural members can be restrained. (page 4, lines 16-21).

The Saito patents do not teach the use of a mixture of HF gas and NH_3 gas, particularly the use of such mixture as a cleaning gas to clean a heat treatment apparatus which has been used to deposit an SiO_2 film. Instead, the Saito patents use HF gas alone as the cleaning gas (see, e.g., the Saito '300 patent at, for example, col. 2, lines 22-25 and lines 53-55; col. 13, lines 28-54; col. 14, lines 18-21 and lines 47-49; and col. 15, lines 8-10 and lines 15-22). Saito '300 teaches the

use of NH_3 (along with SiH_2Cl_2) to form a silicon nitride film (Si_3N_4 film) (see, e.g., col. 11, lines 27-33), and to remove HF (see, e.g., col. 17, lines 27-32).

According to the instant specification:

> In these circumstances, an HF gas as a cleaning gas has been conventionally used independently, or together with an inert gas as a carrier gas. ***However, since an etching rate (synonymous with cleaning rate) of the HF gas with respect to an SiO_2 film deposited by using TEOS is not sufficiently high, it takes a long time for a cleaning treatment.*** In addition, due to an insufficient etching rate, an end point of a cleaning treatment which is previously calculated may be significantly different from an actual end point of a cleaning treatment at which unnecessary film is fully eliminated. ***An overetching damages structural members such as a treatment vessel, a wafer boat, and a heat-insulation cylinder, so that durability of these members may be shortened.*** [emphasis added] (page 3, lines 8-20).
>
> As stated above, by using ***a mixed gas of an HF gas and an NH_3 gas as a cleaning gas***, unnecessary silicon oxide film formed by TEOS can be ***rapidly, efficiently etched and removed at a short time. Thus, a period needed for the cleaning treatment can be greatly reduced, as compared with a conventional case in which an HF gas is solely used as a cleaning gas.*** Therefore, even when a cleaning period is excessively prolonged because of a calculation error of the cleaning period to result in an overetching treatment, the excessive period for the overetching treatment is short. Consequently, damage to the inner structures, i.e., the inner tube 4, the outer tube 6, the wafer boat 10, the heat-insulation cylinder 20, and so on can be significantly restrained. [emphasis added] (page 10, lines 18-30).

Thus, the use of a mixture of HF gas and NH_3 gas in Applicants' claimed methods rapidly and efficiently remove unnecessary SiO_2 film formed by TEOS and deposited on structural members in a heat treatment apparatus, while restraining damage to the structural members.

JP '430 and the Saito patents do not teach or suggest the use of a mixture of HF gas and NH_3 gas as a cleaning gas for cleaning a heat treatment apparatus that deposits an SiO_2 film. Applicants submit that by teaching that NH_3 can be used to remove the HF remaining in the reaction tube (see, e.g.,col.17, lines 28-33 of Saito '300), the Saito patents teach away from using NH_3 and HF in combination as a cleaning gas for removing SiO_2.

Thus, for at least the foregoing reasons, Applicants respectfully submit that claims 1-3, 5 and 6 are not anticipated by JP '430 or the Saito patents.

II. Rejection Under §103(a)

Claim 4 is rejected under §103(a) as being unpatentable over JP '430. Claim 4 depends upon claim 1 or claim 2. Claim 2 depends upon claim 1. As noted above, claim 1 has been amended to recite that a mixed gas of an HF gas and an NH_3 gas is supplied into the treatment vessel. As discussed in detail above, JP '430 and the Saito patents do not teach or suggest the use of a mixture of HF gas and NH_3 gas as a cleaning gas for cleaning a heat treatment apparatus that deposits an SiO_2 film. Claim 4 also includes this feature.

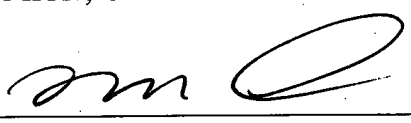
Therefore, Applicants submit that claim 4 would not have been obvious over JP '430 or the Saito patents.

III. Conclusion

In view of the amendments and remarks herein, Applicants respectfully request that the rejections set forth in the Office Action be withdrawn and that claims 1-7 be allowed.

If any additional fees under 37 C. F. R. §§ 1.16 or 1.17 are due in connection with this filing, please charge the fees to Deposit Account No. 02-4300, Order No. 033082M286.

Respectfully submitted,
SMITH, GAMBRELL & RUSSELL, LLP

By: 

Michael A. Makuch, Reg. No. 32,263
1850 M Street, N.W., Suite 800
Washington, D.C. 20036
Telephone: (202) 263-4300
Facsimile: (202) 263-4329

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MAM/MM/cj

Enclosures: (1) Petition for Extension of Time (Two Months)
(2) Check for the Sum of $450